Confined space

Work health and safety procedure

Sydney WATER

1. Overview

1.1. At a glance

What

This procedure is the primary corporate reference on confined space work. It describes the overarching requirements and practical guidance to eliminate and control risks to persons working in or on confined spaces. This includes design, build and management of confined spaces for Sydney Water.

1.2. Scope

Who

This procedure applies to designers, Sydney Water staff and contractors working on sites controlled by Sydney Water. Each business unit and contractors must meet or exceed the requirements in this procedure.

1.3. Objective

Why

Working in confined spaces has been identified as one of Sydney Water's fatal risks. The principle outcomes of this procedure are:

- Identify confined spaces, task risks and preventative controls
- Develop incident preparedness plans for task specific confined space works
- Outline the necessary training and competencies associated with confined space work.

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3. Design of confined spaces

Consideration must be given to the whole life cycle of new facilities, procurement of new plant or modifications of existing Sydney Water assets when designing spaces. Design spaces to ensure they are not confined spaces, where possible. This includes entry for maintenance, cleaning or other purposes.

Confined space design must include provisions for rescue and retrieval in the event of an emergency e.g. davit arms / winch system or enough space to set up for rescue equipment and must be managed in line WHSMS0062 Cranes and Lifting Operations Procedure.

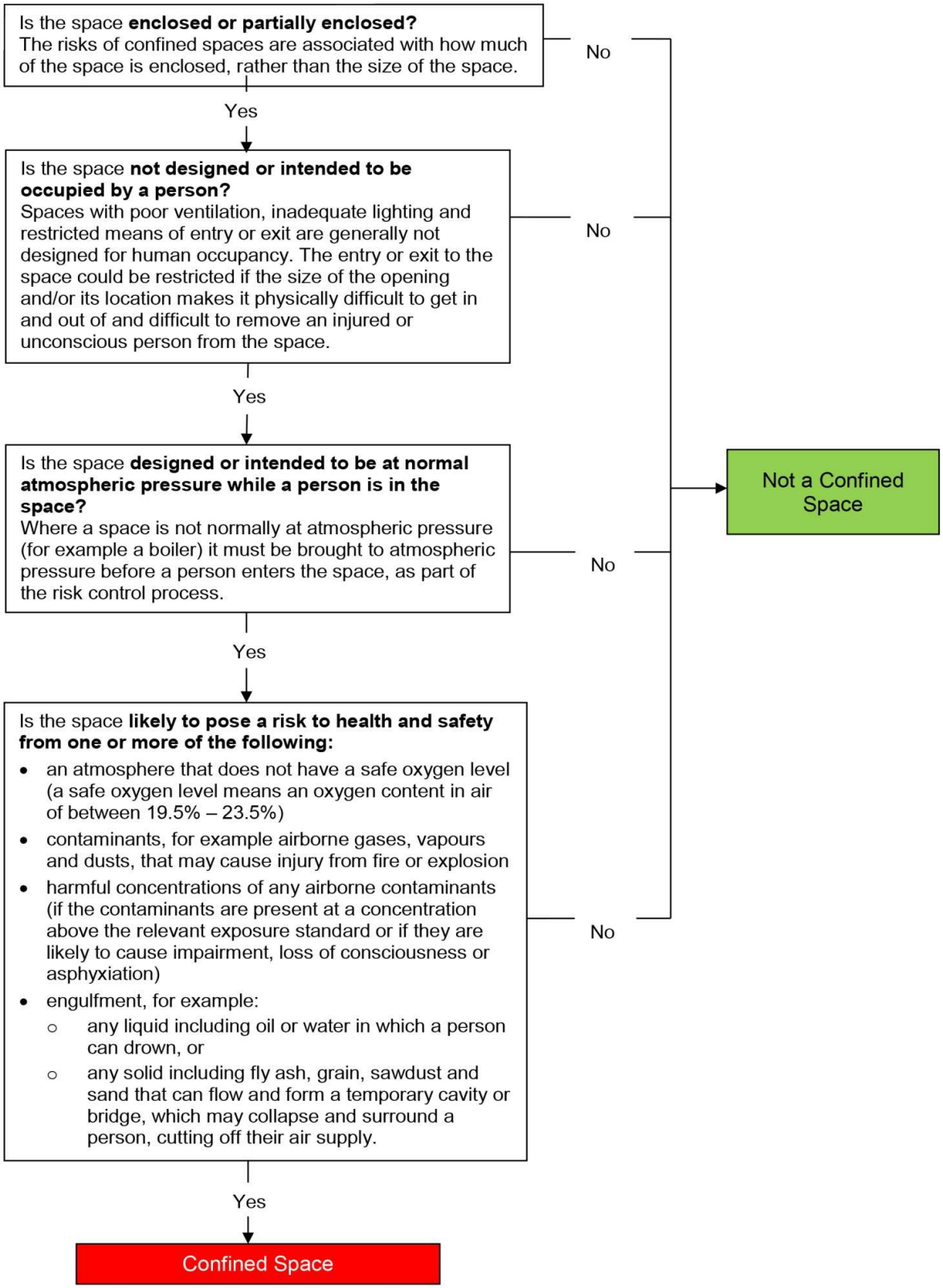
4. Management of confined spaces

4.1. Identification of a confined space

Figure 1. Describes how to determine a confined space. It is important to note that the risk profile of a confined space may change very rapidly and hence attention to a continuous hazard and risk planning process is paramount.

Consultation must occur with all persons who have a work health and safety duty in relation to confined spaces.

Figure 1. How to determine a confined space



4.2. Confined space register

All identified confined spaces must be recorded on a site register, reviewed periodically and made available to workers and visitors on site. Sydney Water recognises the work involving manholes and therefore manholes are exempt from the confined space register requirement.

Confined space registers must be kept on BMIS, SWIM or MAXIMO. Registers for unmanned sites can be obtained from the Site Hazard Report or records in MAXIMO.

Confined space registers must be reviewed or re-assessed every 3 years at a minimum or where the site changes by the asset owner.

> It is important to note that a risk profile of confined space may change very rapidly and hence attention to a continuous hazard and risk planning process is paramount.

4.3. Fixed confined spaces signage

All confined spaces listed on the confined spaces register must have fixed confined spaces signage installed at all entry points to the confined space as per Australian Standard AS1319 (see figure 2).

Figure 2 – Fixed confined space signage

Refer to *Australian Standard (AS) 1319 sets the design standard for safety signs in the workplace and SDIMS0026 Customer Delivery Facility Safety Signage Specification for further guidance*.

5. Management of works in confined spaces

5.1. Confined space standard requirements

The confined space standard outlines the 'what' Sydney Water will do to manage risks associated with working in confined spaces.

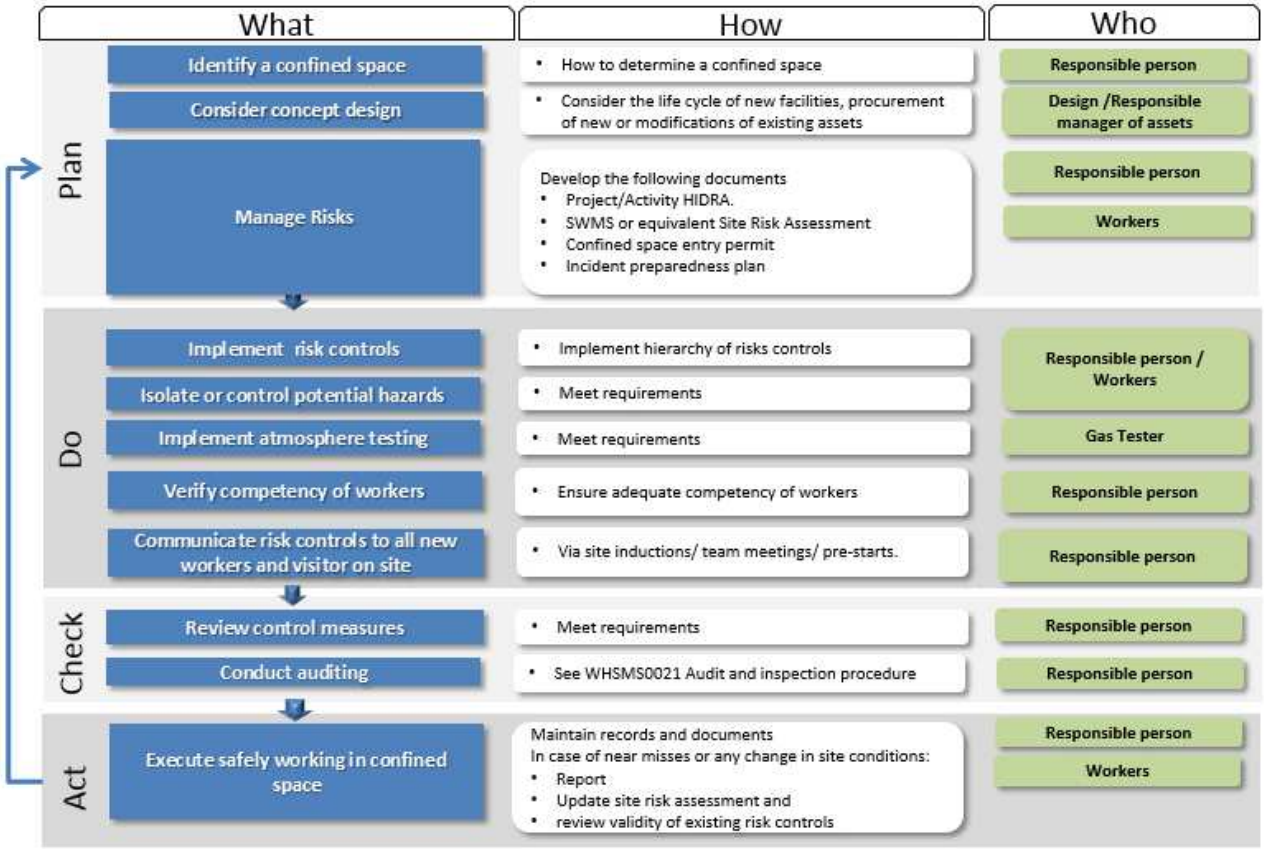
Workers must be protected from injury through the implementation of risk-based controls in accordance with this procedure, related corporate procedures and legislative requirements.

5.2. Planning for work

Planning is a mandatory requirement to eliminate or minimise risks arising from working in confined spaces. All workers involved in the planning, design, maintenance and rescue must have clearly defined roles and responsibilities to ensure work in a confined space is carried out in a controlled and safe manner. The responsible person must determine if the need for entry can be eliminated by using new work methods or technologies e.g. closed circuit television. Refer to *AS 2865 Confined Spaces.*

Figure 3. summarises the main steps that must be considered during the planning of working in a confined space.

Figure 3. Working in confined spaces in Sydney Water



6. Confined space works procedure

6.1. Hazard identification and risk assessment (HIDRA)

The responsible person must carry out a Hazard Identification and Risk Assessment. All workers, including stand-by persons and responsible persons, must be involved to help identify hazards working in or on confined spaces prior to commencing the work.

The following hazards must be considered:

- the use of the confined space e.g. water, sewage, stormwater, recycled water, flammable gas, air quality hazards, chemicals and trade waste
- associated plant e.g. pumps, valves, mixers, and chemical dosing units
- asset design and structural hazards e.g. narrow pipes and awkward access
- nearby hazards e.g. water or gas mains, large water storages, vapours from fuel or chemical facilities, engine exhaust, traffic, contaminated land, other construction or maintenance work, stormwater runoff, groundwater infiltration or tidal ingress
- task or site related hazards that may exist for any work e.g. hot work, hot and cold environments, noise, electricity, manual handling, excavation, working at height, asbestos, poor lighting, working in, near or over water
- Is the hazard associated with any airborne contaminant or unsafe level of oxygen?
- type of incident preparedness required e.g. arrested fall recovery
- plant that may be some distance away or upstream from the confined space entry

6.2. Risk assessment results

Entry is not permitted unless the HIDRA risk rank *after* controls is in the range of medium to low. It is most likely that a combination of controls will be required to achieve this.

A risk rank *after* controls of Very High- High or above must be reported to the Level 3 Manager of the confined space entry and support teams, and a risk rank of high or above *after* controls to the relevant level 4 manager.

Examples of factors that may determine the risk rank include:

- The work area e.g. segregation from sewage can impact hydrogen sulphide.
- Task related hazards have higher risks in a confined space e.g. entrapment for divers, flow if working in water, fumes or smoke from hot work, vapours from painting or cleaning, noise from ventilation fans or tools, and heat or entrapment by plant.
- The design of the confined space. A deep access chamber may have higher risks than a shallow one, or a narrow pipe may have higher risks than a wide pipe.
- The distance between access points. The longer the distance, the higher the risk.
- Work inside might have higher risks if there is also work being done on the outside.
- The amount of natural ventilation available. Less ventilation is a higher risk.
- System demand. Peak flow creates a higher risk of flooding than off peak.

- The risk of flooding in a stormwater or sewer pipe, or an asset located in a flood zone, is higher if there is rainfall in its stormwater catchment or tidal zone.
- Unrelated activity nearby e.g. excavation causing a water or gas main break, or vapours entering the confined space from fuel transfer facilities.

Note: Where risk assessors are not confident that they have the necessary capability or authority to implement a satisfactory risk action plan, they should escalate the risk (and risk action plan) to the next level of authority.

6.2.1. Risk controls

Controls must be documented in a Safe Work Method Statement (SWMS).

The responsible person for entry must not permit entry until all relevant controls are confirmed. Personnel training, fitness to work and current training requirements are checked and confirmed.

For traversing, a traverse plan must be prepared and signed off by the responsible manager for the traverse.

6.3. Signage

Before any work starts, signs must be erected to prevent unauthorised entry of persons. Figure 4. are some examples of signage.

Signs must warn against entry by people other than those who are listed on the confined space entry permit, and must be placed at each entrance to the confined space. Signs must be in place while the confined space is accessible, including when preparing to work in the space, during work in the space and when packing up on completion of the work.

Signposting alone should not be relied on to prevent unauthorised entry to a potential confined space.

Figure 4. Confined space signage

Refer to *Australian Standard (AS) 1319 sets the design standard for safety signs in the workplace and SDIM0026 Facilities Site Signage specification for further guidance*.

Sites may temporarily become confined spaces while works are being conducted (such as machinery wells). Signs must be erected as per section 6.3 to prevent any unauthorised entry into the confined space.

6.4. Isolation or control of potential hazards

6.4.1. Flow management

Follow the relevant HSP-070 Flow Isolation and/or Flow Management (FIFM) procedure.

Entry into a confined space hydraulic asset is not permitted until a risk assessment has been completed. Entry is not permitted until the responsible person for Flow Isolation/Flow Management has confirmed control measures are in place and proven, and conditions are as expected.

The responsible person for Flow Isolation/Flow management must not commence recommissioning until the responsible person for Confined Space entry closes out the Confined Space entry permit.

6.4.2. Mechanical or electrical plant and equipment

Electrical or mechanical plant and equipment that may create a risk to persons must be isolated before entry.

Entry is not permitted until the responsible person for isolation has confirmed it is locked and tagged out as per the WHSMS0052 Energy Isolation Lock Out Tag Out procedure.

Examples include: pumps, mixers, switch rooms and carbon dioxide fire suppression systems. Chemical dosing units that dose into access chambers and assets must be isolated, if work is to be done in or near the chamber.

The responsible person for recommissioning must not commence recommissioning until the responsible person for entry closes out the Confined Space entry permit.

6.4.3. Trade waste discharge

Sydney Waters' asset geographical information system Hydra Geographical Information System (GIS) must be checked for sewer work, to see if there are any discharge hazards nearby. Refer to the sewage pumping station Trade Waste Classification Register and/or contact the Trade Waste Officer for the relevant system to find out if there are any 'significant skin contact' or 'significant air quality' hazards.

At sewage pumping stations, check the site hazard information and follow the controls for any trade waste discharge that's identified.

Refer to section 6.7.3 and 6.7.4 for additional gas testing requirements at sites with significant trade waste air quality hazards.

For sewers downstream of a hospital with a nuclear medicine unit, only work downstream of where the radiation dilution zone ends, as labelled in the Hydra GIS. Refer to D0000146

Managing exposure to Ionising Radiation for guidance. If entry is unavoidable and trade waste discharge is required to be isolated before entry, arrange this with the trade waste officer. Alternatively, avoid entry when discharge is occurring, if directed by the trade waste officer or the site hazard information.
A Sydney Water Trade Waste Hazard Committee has been established. For more information see iConnect service delivery networks page.

6.4.4. Hot work

Hot work in or on a confined space must be done according to an approved hot work permit.

Hot work in or on a confined space that is a zone 0 flammable gas hazard (FGH) area is not permitted. It must comply with WHSMS0005 Control of Hot Work to be done in or on a zone 1 or zone 2 area. Refer to the site Hazardous Area Verification Dossier for zone classifications.

6.4.5. Hazardous plant or processes

The following specific hazards are not permitted in a confined space:

- Ignition sources inside or within 3m of an opening, until flammable gas levels have been proved safe by air quality testing. This includes any powered plant, as well as flames, hand tools, power tools, and non-intrinsically safe lights, radios and phones.
- Liquid oxygen or hydrogen peroxide dosing of a sewer when people are inside. This is to help control the risk of explosion from an oxygen rich atmosphere.
- Gas cylinders (except those used for self-contained breathing apparatus).

Ensure that nearby vehicles or plant, e.g. a generator used to power ventilation fans are positioned so that exhaust or vapours cannot enter the confined space.

6.5. Atmosphere safety

6.5.1. Natural ventilation

Asset designers must plan natural ventilation into new sewers to minimise gas build up.

Natural ventilation may only be used for entry into confined spaces with a low risk of poor air quality.

6.5.2. Mechanical ventilation

Control air quality hazards by forced ventilation, in the following instances

- sewer traversing
- work in sewage pumping station wet wells
- stormwater traversing when there is no natural ventilation

- any work where air quality hazards (*except oxygen rich air or ionising radiation) are outside the limits of HSG0512 Confined Space Ventilation and Air Quality Monitoring
- where there is a risk of high temperature and humidity
- Hydraulic conditions e.g. flow, engulfment, FIFM.
- Ventilate before entry until the air quality is within the limits in HSG0512 Confined Space Ventilation and Air Quality Monitoring and maintain until all persons have exited.

Entry is not permitted until the gas testing on site confirms that air quality is within the safe limits. Forced ventilation is not a recognised control for oxygen rich air or ionising radiation.

Portable ventilation is used to supplement existing ventilation or provide ventilation.

6.5.3. Mechanical extraction

Mechanical extraction must be used if there is no forced ventilation and the work could generate or release fumes, smoke or vapours, e.g. welding, painting or cleaning.
Ensure flammable gases are below 5% of their lower explosive limit (LEL) to do this.

6.5.4. Lighting for access and work

Lighting must be intrinsically safe unless air quality testing can confirm flammable gases are below 5% of their LEL, before lights are switched on, and maintained at that level.

6.6. Purging before entry

6.6.1. Chemical dosing

In larger sewers and sewage pumping stations (SPS), chemical dosing can be used to control hydrogen sulphide gas as long as the pH of the sewage stays between 6 and 8 while the sewer is occupied, and a safe level of dilution is determined based on the flow volume. Refer to HSG-553 Safe Systems of Work for Sewage Facilities near Chemical Dosing Units for guidance. Check the Hydra GIS for the location of the chemical dosing unit and contact the relevant waste water system operations officer to arrange a safe level of dosing.

6.6.2. Cleaning

Chemical storage tanks must be cleaned before entry by a method recommended by the tank manufacturer or by specific work methods and or chemical supplier.
Access chambers or SPS wet wells may need to be washed down before entry if identified in the Hydra GIS as having a discharge hazard. Grease traps must be pumped out before entry.

Treatment process vessels e.g. digesters and grease traps must be cleaned if it improves hygiene and ease of movement. Refer to *AS / NZS Handbook HSB 213:2003 Guidelines for safe working in a confined space* for guidance.

6.7. Atmospheric testing and monitoring

Exposure to substances or mixtures must be considered prior to doing any task associated with confined space. Potential of exposure to hazardous materials may occur e.g. lead dust, asbestos, gas or rust may be released into the atmosphere.

Most exposure occurs through the inhalation of vapours, dusts, fumes or gases through inhalation or absorption through the skin or ingestion.

The airborne concentration of any substance or mixture that is hazardous to health must be kept as low as reasonably practicable to minimise the risk to health, regardless of whether there is an exposure standard. A current list of all declared National Exposure Standards can be obtained from the *Safe Work Australia Hazardous Substances Information System (HSIS) or Adopted National Exposure Standards for Atmospheric contaminants in the occupational environment* *[NOHSC:1003].*

Information about the hazards of a chemical should be available from the label or Safety Data Sheet (SDS) for most substances or mixtures.

To determine whether exposure standards have been exceeded air monitoring may be required. Refer to *Guidance on interpretation of workplace exposure standards for airborne contaminants.*

6.7.1. Methods and limits of gas testing

Entry is not permitted into a confined space until a gas tester has tested the air quality.

A competent person must test and monitor the air quality before entry and while the space is occupied. Entry is not permitted until gas testing has taken place and the air quality is confirmed to be within the limits of Table 1. Air quality exposure standards.

Table 1. Air quality exposure standards.

Air quality hazard	Limits
Oxygen	19.5 % (min) 23.5 % (max)*^
Carbon monoxide	30 ppm (max)
Hydrogen sulphide	10 ppm (max)
Flammable gas or vapour (e.g. methane) *	5 % of the lower explosive limit (LEL) for that gas or vapour, and the TWA concentration for that substance (e.g. the LEL for methane is 5% by volume in air, therefore the limit is 5% of 5% by volume in air).
Others identified in the HIDRA or suspected by the team.	The TWA concentration.
Volatile organic compounds	10 ppm (max)
Ionising radiation*^	0.5 mSv /hr (max)

Sewage aerosols	None inhaled
Heat stress*	The point when any of the following physical warning signs first appear: • Muscle spasm or pains. • Feeling hot, exhausted and weak. • Persistent headache. • Thirst and nausea. • Giddiness and faintness. • Heavy sweating. • Pale cool clammy skin. • Rapid weak pulse.
Hypothermia*	The point when any of the following physical warning signs first appear: • Hands become numb. • Shivering is not under voluntary control. • Loss of fine motor co-ordination (a person may have trouble with buttons, laces, zips). • Slurred speech. • Difficulty in thinking clearly. • Irrational behavior – sometimes a person will even begin to discard clothing.
^ = Ventilation can't control against this hazard. * = Breathing apparatus can't control against this hazard	

Traverse parties / work teams must use a personal gas detector in the confined space.

The space must be evacuated if the air quality hazard limits in HSG0512 Confined Space Ventilation and Air Quality Monitoring are exceeded.

Air quality results must be recorded on Attachment 3 Confined Space entry permit and kept for a minimum of 30 years in BMIS or SWIM.

6.7.2. Gas monitoring equipment

All Sydney Water sites that may expose workers to the risks of confined spaces must ensure personal gas detectors are provided to any worker that may be required to enter a confined space. All monitoring equipment must comply with the following:

- All gas monitoring equipment must be within calibration dates as specified by the manufacturer and calibrated by person(s) approved by the manufacturer, supplier or authorised repair agent only. Evidence of calibration certificates must be obtained.
- All gas monitors must be 'response-tested' within 24 hours of use and results documented on a 'response-test' register. The person conducting the response test must record the individual gas readings and make them readily available. See Table 2. Limits for safe atmosphere for reference during 'response test'.
- Any gas monitor found to provide abnormal readings during the response test must be immediately removed from service and sent back to the supplier or manufacturer, or authorised repair agent.

- Some confined spaces and associated work activities may require additional air quality testing and monitoring when:
    - Trade waste agreements identify potential for gases that cannot be measured by standard 4 in 1 gas detectors
    - The activity being conducted has been identified as particularly high risk with regards to gas hazards
- Additional monitoring may be conducted by a **F**ront **L**ine **A**dvanced **G**as-tester (FLAG) or by a **S**pecialist **G**as **T**ester (SGT)

Table 2. Limits for safe atmosphere for reference during 'confined space work'.

GAS	LIMITS
% L.E.L	5% Max
% Oxygen	19.5 – 23.5
CO Level	30 ppm Max
H2S Level	10 ppm Max

6.7.3. Front Line Advanced Gas (FLAG)-tester training

Confined space trained workers may undertake FLAG training. The FLAG training course is based on the nationally recognised unit of competency "MSMWHS217 gas test atmospheres" tailored to provide an understanding of SWC trade waste affected assets, advanced gas monitoring techniques including the use of a 6 in 1 gas monitor. FLAG trained workers will be able to undertake work at Significant Air Quality stations where a 6 in 1 gas meter can measure all identified trade waste contaminants.

An E-learning package regarding FLAG training is available to all SWC staff and contractors to give an awareness of the SWC policy towards gas testing.

6.7.4. Specialist gas testers

Specialist gas testers are engaged for atmospheric testing in confined spaces where potential contaminants are beyond the detection capabilities of (6 gas) FLAG detectors.. Results should be recorded on an appropriate "continuous air monitoring" form and kept for a minimum of 30-years in BMIS or SWIM.

6.7.5. Specialist gas tester delegation to other competent gas testers

The specialist gas tester may delegate ongoing monitoring duties to a person on the confined space support team who is competent in monitoring, only after confirming that there is no significant trade waste (air quality) hazard present, or where it is confirmed that these hazards have been isolated from the confined space.

The specialist must confirm that all other air quality parameters are within limits and advise the responsible person for entry on any further requirements.

Where available, IICATS monitoring and mobile LEL monitoring stations should be used to get information about hydrogen sulphide gas, and mobile LEL stations used to get information about flammable gases, when planning sewer work.

6.8. Communication with people inside the confined space

Continuous communication between the confined space entry team and the stand by person on the surface must be maintained.

A communication system is needed to enable communication between workers inside and outside the confined space, to summon help in an emergency.

Communications methods may be by voice, radio, hand signals or other suitable means. Consideration must be given for any black spots or restrictions caused by asset design, phone network limitations, noise, light, darkness, dust, people or equipment blocking radio signal.

A back up method must be tested and ready in case the primary system fails.

Entry is not permitted until all communication methods have been tested and understood by the confined space team.

6.9. Standby person(s)

A standby person(s) must be assigned to continuously monitor the wellbeing of those inside the confined space. If practicable observe the work being carried out and initiate appropriate incident preparedness if necessary.

The standby person(s) must understand the nature of the hazards inside the particular confined space and be able to recognise signs and symptoms that workers in the confined space may experience.

The standby person(s) must remain outside the confined space and do no other work which may interfere with their primary role of monitoring the workers inside the confined space.

6.10. Visitors

Visitors entering confined space must comply with the requirements of this procedure.

Where a visitor is not compliant to section 12.2 Training Requirements, a risk assessment must be conducted and approved by the relevant level 3 manager.

6.11. Securing confined space entry from unauthorised entry

Barriers or signage must be used over or around open vertical access points to prevent unauthorised or accidental entry while work is underway. Barriers or signage must be

designed and positioned so they don't restrict ventilation. Consider the type of barrier used where falls to children or animals are a risk.

The entrance to the space or leading to the space must be closed and secured when work is finished to prevent unauthorised or accidental entry.

Where practicable, the sides of open concrete stormwater drains must be fenced to restrict access to the enclosed parts.

6.12. Fall arrest system

A fall arrest system must be used, if protective barriers are not reasonably practicable and there is a risk of falling. The type of fall arrest system and its limit of use must be suitable to the task. All components must comply with *AS/NZS 1891.4 Industrial fall-arrest systems and devices - Selection, use and maintenance.* For mobile or transiant works (such as on manholes), portable means for fall prevention and rescue / recovery must be provided.

An anchorage sling may be used to form an anchor around a solid permanent structure, as long as it is clear to a competent person that it will meet the required strength for the number of people it is intended for and comply with the *AS1891.3 Industrial fall arrester systems and devices Part 3: Fall arrester devices.*

6.12.1. Tripods assemblies and Davit systems

Where tripods and davit systems are provided, they must be individually numbered and form part of the asset's inspection and maintenance regime of visual inspection by the user before each use and undergo 6-monthly inspections by a formal certified service provider (unless specified otherwise by the manufacturer).

Records must be regularly updated and maintained on site and / or be readily accessible to the user. Consideration should be given to the ergonomic factors of the equipment selected.

A standby person can anchor to the same tripod as the person on the rope access system, if it meets the required strength for two people. *AS4142.3 Man-made fibre ropes for static rescue lines.*

6.13. Confined space access

6.13.1. Openings used for access

Openings used for access must remain open with standby persons present until the responsible person for entry confirms that all people have either exited from the same point or have arrived at another safe exit.

Openings must be closed and secured when work is finished.

6.13.2. Dimensions for openings

Table 3.Minimum widths required for openings

Without breathing apparatus	• **450 x 400 mm for rectangle and oval entries** • **450mm diameter for round entries**
With breathing apparatus	• 750 x 700 mm

6.13.3. Dimensions for access and work in hydraulic assets

Table 4. Dimension requirements for entry to hydraulic assets

Access chambers	• **750 x 700 mm internal diameter**
Water assets (pipework):	• at least 750 mm diameter with no water in it
Sewer assets (pipework)	• at least 900 mm diameter and at least 750 mm of air space between the water level and its roof
Stormwater assets (pipework)	• at least 900 mm in height with the water level at dry weather conditions

6.13.4. Vertical access

Responsible managers of assets must consider vertical access in order of elimination of risk:

1. Stairways with hand rails.
2. Step ladders with handrails.
3. Rung ladders.
4. Step iron ladders

If nothing is present, implement adequate controls as per the risk assessment or other means of access.

Responsible managers of assets must document why higher preferences are not reasonably practicable, if a lower preference of access is chosen.

Load force, lengths, staggering of landings, direction changes, angles and other dimensions must comply with *AS 1657-2013 Fixed platforms, walkways, stairways and ladders – Design, construction and installation.*

The responsible person for entry must obtain an engineer's report before entry if the structural integrity of access is doubtful, or use another safe access.

6.13.5. Rope access

Where no other form of fixed access is accessible a tripod or davit with a working rope, harness and lanyard, and a fall arrest device must be used e.g. maintenance holes and hatches. All equipment must comply with *AS/NZS 4488.1 Industrial rope access systems.*

Rope access systems must be visually checked by the user before and after each use. Defective components in rope access systems are not to be used. They must be repaired or discarded. A winch (that includes a braking device) or a rope block must be used to minimise manual handling risks.

6.13.6. Access from roads

Access should be made off roads where possible, to reduce traffic hazards. If this is not possible, an approved traffic management plan must be implemented if entry or ventilation is on or near a road where it could disrupt traffic or cause a risk to any person. Follow *HS-051 Safe Working on Roads* to do this.

6.14. Personal Protective Equipment

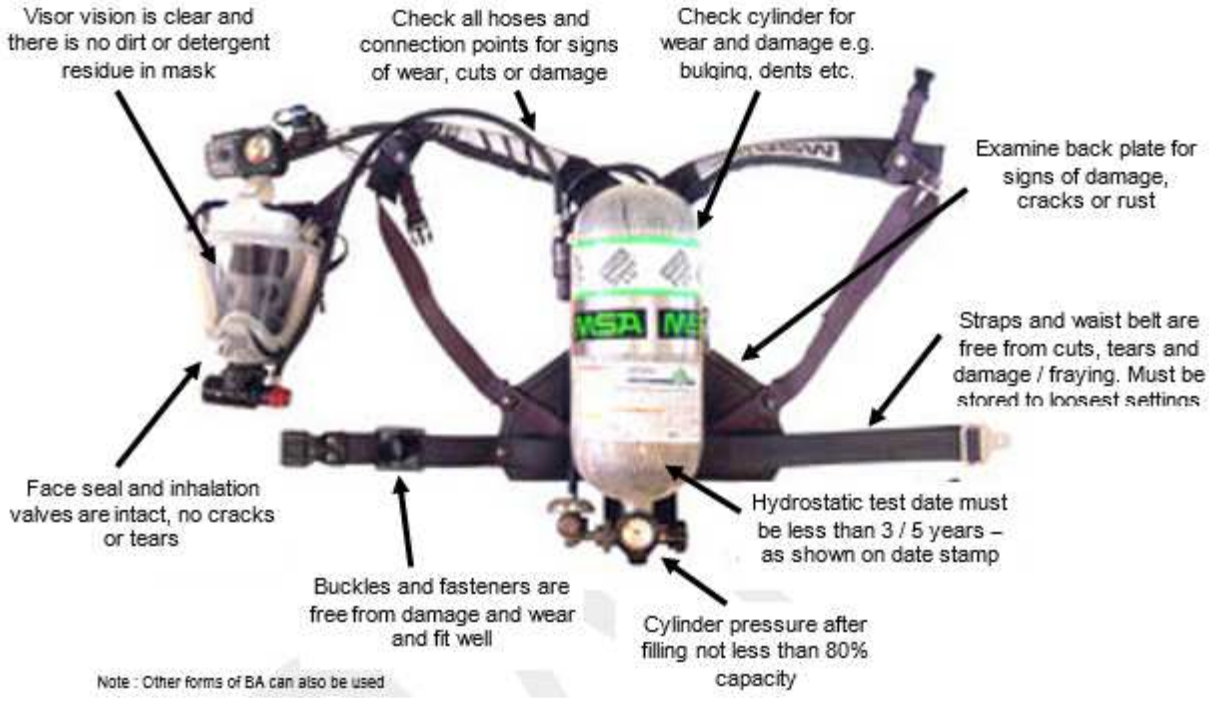
6.14.1. Inspection requirements for breathing apparatus

Inspection requirements for Self-Contained Breathing Apparatus (SCBA) or SSR units unless manufacturer instructions state otherwise:

- Pre-use – Visual inspection undertaken by personnel trained in confined space and the SCBA or SSR units
- Monthly – A documented visual inspection for all SCBA or SSR units on emergency stand-by (see Figure 5 below for inspection details)
- Annually – Inspected by a qualified person approved by the manufacturer / supplier
- Every 3 years – Hydrostatic Testing of Fibre-glass wrapped air cylinders only and inspected by a qualified person approved by the manufacturer / supplier

  Every 5 years – Hydrostatic Testing of Aluminium and carbon fibre cylinders inspected by a qualifed person approved by the manufacturer / supplier.

Figure 5. Monthly inspection checks for self contained apparatus or SSR units



6.14.2. Storage of equipment

All confined space equipment is to be stored in designated areas that will protect equipment against damage contamination and the build-up of dust or dirt.

The task risk assessment will determine what personal protective equipment (PPE) is required.

Ensure equipment is regularly maintained and inspected.

7. Incident preparedness plan

Responsible persons must ensure a task specific incident preparedness plan is established and communicated. Plans must be rehearsed as necessary to ensure they are efficient and effective for potential emergencies. Incident preparedness plans must be available to all support crew members.

Incident preparedness plans must address as a minimum:

- The confined space entry team and the responsible person for entry and standby persons in an evacuation, rescue or suspended unconscious or injured workers
- consistent with the specific controls identified in the HIDRA conducted prior
- the opening into the confined space is sufficient to allow emergency access
- the evacuation route, location and distance to the exit points, for complex confined spaces such as sewers

- means of constant communication and a back-up communication method if the primary system fails
- the likely conditions inside, the size, weight and number of affected people and how to rescue unconscious or injured people from awkward areas that aren't near exits
- how obstructions may impact an evacuation or rescue e.g. a rope access system needs a direct path free from entanglement
- how emergency services will be contacted, response times, access and subsequent interface with emergency crews
- engaging a specialist rescue service if the confined space team does not have sufficient capability for a rescue
- consulting the fire brigade if they are relied on as the primary rescue service
- first aid equipment required
- Rescue equipment required e.g. a rope access system, emergency breathing apparatus on stand-by and confined space harnesses for retrieval.
- Physical copy of confined permit displayed at entry points.

Note: Although emergency services can form part of overall incident preparedness plan, they are not to be relied upon as the sole form of emergency response / rescue.

8. Confined space entry permit

The responsible person for entry must complete an entry permit and ensure all controls are confirmed, personnel are fit and trained for the task and current training sited before entry is permitted. A confined space entry permit provides a formal check to ensure all controls are in place before workers are allowed to enter the confined space. It also provides a means of communication between site management, responsible person(s) and those carrying out the work.

The permit must have the following details:

- specify the confined space to which the permit relates
- record the names of persons permitted to enter the confined space and the period of time that the work will be carried out
- set out risk control measures based on the risk assessment
- Contain space for an acknowledgement that work in the confined space has been completed and all persons have left the space.

WHSMS0068.03 Attachment 3 Confined space entry permit is a generic Sydney Water template.

The permit must be re-validated whenever there is a break taken.

A new or separate permit must be filled out whenever:

- a change of team member or responsible person
- the confined space team exits and then re-enters at another location

- more than one team enters the confined space from separate locations
- there has been an evacuation and the team plans to re-enter the confined space
- If new hazards arise, works must cease and the task specific HIDRA must be updated. The confined space entry permit must never be used to record 'last minute changes'.

The responsible person for entry must close out the entry permit when works have been completed.

Confined space entry permits must be stored for at least 30 years after the confined space work is completed.

9. Fitness to work in confined space

The responsible person must ensure all workers who undertake confined spaces work are declared fit, have current confined space training and be fit to undertake confined space work on the day of the task. Refer to confined space fitness to work procedure.

10. Review control measures

Control measures that have been implemented must be reviewed and revised to make sure they work as planned and to maintain the identified risks associated with confined space work.

Control measures may be reviewed using the same methods as in section 6.1. Workers must be consulted when undertaking a review of the controls in place. Example of issues to consider when reviewing controls:

- Are the control measures working effectively in both their design and operation?
- How effective is the risk assessment process? Are all hazards being identified?
- Are workers actively involved in the risk management process? Are they openly raising health and safety concerns and reporting problems promptly?
- Can work be eliminated? Have new work methods or new equipment made the job safer?
- Are safety work procedures being followed?
- Has the instruction and training provided to workers been successful?
- If new legislation or new information becomes available, does it indicate current controls may no longer be the most effective?
- Is there any change planned to any plant or structure that may create a confined space or change the nature of an existing confined space?
- Has an incident occurred as a result of work carried out in a confined space?

If problems are found, go back to any point in the risk management process, review the information and revise any decisions about controls measures. Any identified hazards, incidents or near misses must be recorded in SWIRL.

11. Definitions

Term	Definition
6 in 1 gas meter	A gas meter that measures Volatile Organic Compounds and Ammonia as well as standard confined space gases - Lower explosive limit (Methane), Carbon Monoxide, Hydrogen Sulphide, Oxygen
Competent person	Person who has, through a combination of training, education and experience, acquired knowledge and skills enabling that person to perform correctly a specified task.
Contaminant	Any dust, fume, mist, vapour, gas or other substance in liquid or solid form, the presence of which may be harmful to health and safety. The following terms are used in calculating levels of atmospheric contaminants: (a) Time-weighted average (TWA) - The average airborne concentration of a particular substance when calculated over a normal eight-hour work day, for a five-day working week. (b) Short-term exposure limit (STEL) - A l5 minute TWA exposure which should not be exceeded at any time during a workday even if the eight-hour TWA average is within the TWA exposure standard. Exposure at the STEL should not be longer than 15 minutes and should not be repeated more than four times per day. There should be at least 60 minutes between successive exposures at the STEL. (c) Peak - A maximum or peak airborne concentration of a particular substance determined over the shortest analytically practicable period of time, which does not exceed 15 minutes. Refer to HSG0512 Confined Space Ventilation and Air Quality Monitoring
Confined space entry team	Entry means the action by which the workers passes through an opening into a permit-required confined space as soon as any part of the entrant's body breaks the plane of an opening into the space.
Confined space support team	Support team means the personnel designated to rescue employees from permit spaces. The number of persons required must be determined in the specific risk assessment.
Entry (to a confined space)	Entry into a confined space is when a person’s head or upper body is within the boundary of the confined space.
Exposure Standard	An airborne concentration of a particular substance in the person's breathing zone, exposure to which, according to current knowledge, should not cause adverse health effects nor cause undue discomfort to nearly all persons. The exposure standard can be of three forms: • time-weighted average (TWA) • short-term exposure limit (STEL) • peak exposure limit HSG0512 Confined Space Ventilation and Air Quality Monitoring.
Front Line Advanced Gas (FLAG)-tester	Confined space trained worker, given additional training in gas monitoring techniques and equipment to conduct detection for Volatile Organic Compounds and Ammonia using a 6 in 1 gas meter.

Term	Definition
Gas tester	This person is trained to operate, interpret and response test gas testing equipment and is authorised by management to perform the necessary tests to decide whether a confined space is fit to enter. Gas testing can only be performed by persons trained in gas testing, using equipment appropriate for the anticipated contaminants. This person can perform other duties provided these do not conflict with the gas testing task.
Hydra GIS	Sydney Water's asset geographical information system.
IICATS	Integrated, Instrumentation, Control, Automation and Telemetry System.
Lower explosive limit (LEL)	Lowest concentration (percentage) of a gas or vapor in air capable of producing a flash of fire in presence of an ignition source (arc, flame, heat).
Purging	The method used to displace any contaminant from a confined space.
Responsible person	For the purpose of this procedure: the person in charge of the confined space for all safety precautions including this procedure and legal compliance, and / or Relevant managers/supervisor's representative given authority to discharge their obligations.
Responsible asset manager	The person responsible for the operation of the asset.
Specialist gas tester	Member of Air Quality and Atmospheric Monitoring (AQAM) team, trained and equipped to conduct gas testing at for all trade waste gas contaminants as well as activities that have been identified as high risk in relation to gas. SGT have technical qualifications and are trained to operate and response - test gas testing equipment, including broad range detectors, hydrocarbon detectors and detector tubes and assess portable ventilation systems. They are authorised by management to carry out atmospheric testing in confined spaces where potential contaminants cannot reasonably be anticipated or where contaminants beyond the detection capabilities of (6 gas) FLAG. They also perform tests to verify whether hot work is permitted in a flammable gas hazardous area Zone 1
SPS Trade Waste Register	All Sydney Water sewage pumping stations (SPS) have been categorised to identify trade waste risk. These categories are available on iConnect.
Safe oxygen level	Minimum oxygen content in air of 19.5% by volume under normal atmospheric pressure and maximum oxygen content in air of 23.5% by volume under normal atmospheric pressure.
SWIRL	Sydney Water Incident Recording and Learning system
Trade waste hazard	Any hazardous aqueous liquid or substances contained in it that may be produced at the premises of an industrial or commercial activity and discharged into a sewer. This may also include run off from contaminated surface water and groundwater.

Term	Definition
Traverse	Lateral movement of more than 10m from the access point / chamber inside a water, sewer or stormwater conduit. Does not include short closed sections of a stormwater system that is otherwise open, such as under a single lane road.
Volatile substance	Substances, which change readily from a solid or liquid to vapour, such as petrol.
Visitor(s)	A person entering a potential or actual confined space for purposes other than undertaking work for or behalf of Sydney Water. All visitors must be approved by the appropriate Level 3 manager.

12. Context

12.1. Accountabilities

Position	Accountabilities
Confined space support team	Trained in specific task incident preparedness and rescue equipment from confined spaces. Remaining accountabilities as per workers below.
Confined space entry team / Workers	Must not enter a confined space unless they are fit to work and have the following: • the appropriate confined space training • instruction on this WHS Confined space procedure • involvement and/or trained in the development of the risk assessment • trained in (including the rehearsal of) emergency procedures • a confined space entry permit • appropriate personal protective equipment and trained in its use Must never carry out confined space lone working.
Level 3 Managers	• Ensure the confined space procedure is effectively implemented and used in their area of accountability. • Ensure sufficient resources are provided to ensure compliance with the requirements of this procedure. • Ensure training is provided to the users of this procedure. • Ensure the application of this procedure is regularly audited in the area of accountability for compliance to this standard.
Manager, Infrastructure/Asset Design	• Ensure that confined space standards are reflected in design as appropriate. • Ensure the design objective with respect to confined spaces is to eliminate entry to as low as reasonably practicable (ALARP).

Position	Accountabilities

	• Ensure that designers consider confined space throughout the lifecycle of the asset, and for all foreseeable activities and uses of the asset, during the phases of construction, operations and maintenance.
	• Ensure that designers provide written information about:
	  - identified hazards and their mitigation
	  - methods for the safe construction, installation, and use of the designed structures and plant
	  - residual risks in the design work
	• Ensure consultation occurs with people affected by confined space identification or eliminating the need for entry through design.

Responsible person(s)	• Ensure a system exists for identifying tasks requiring confined space entry permit. • Ensure a system exists for the selection, identification, storage, inspection and maintenance of all confined space equipment. • Ensure persons are trained, assessed as competent and appointed to issue confined space permits, conduct work and act as a standby person and are assessed at the appropriate intervals. • Ensure all fall protection equipment, anchorage and attachment points are recorded on a register and inspected at the appropriate intervals. • Ensure a register is maintained to identify those persons trained. • Ensure any equipment used in the monitoring of a confined space, such as gas detector, is appropriate and calibrated. • Ensure that the persons who are to carry out the work are fit for work, trained, informed of and comply with the requirements of the permit. • Ensure consultation occurs with affected persons and document HIDRA & risk control measures and procedures, and incident preparedness plans.
Stand-by persons	• Know the hazards. This can often include using air monitoring equipment to keep a close watch on the atmospheric conditions inside the confined space and communicate any changes observed. Ensure that pure oxygen or a gas mixture in a concentration of more than 21% of oxygen by volume is not used for the purging or ventilation of a confined space and ensure that, if a concentration of flammable contaminant in the atmosphere of a confined space is found to be more than 5% of its LEL all persons must leave the confined space. • Know the behavioural effects of the hazards. • Be able to identify the authorized entrants. • Communicate with entrants throughout the duration of the work period. • Monitor and evacuate entrants if necessary. • Summon rescue, if needed.

Position	Accountabilities
	• Warn away unauthorized persons. • Ensure no person or animals enters. • Ensure no persons works in, on or around a confined space unless authorised by a permit. • Remain outside until relieved. Follow instructions and do not leave their position while person(s) are in the confined space. (Note: In the event of an injury or collapse of the person in the confined space, the stand-by person's primary duty is to summon help). • Do not enter the confined while persons are in the confined space. • Understand the communication and emergency procedures, ensuring entrants have clear understanding of the procedure and know what to do in the event of an emergency. • Ensure that, before authorisation is given for the confined space to be returned to service, the person in direct control of the work in the confined space acknowledges, in writing: - the work in or on the confined space has been completed - all persons involved in the carrying out of the work have left the confined space.
Visitors	Follow all directions and controls as per this procedure and the responsible person allocated to escort the visitor onto site.

12.2. Training and competencies

Position	Training or competency	Frequency
Workers and contractors involved in confined space work	Confined space initial training (Must comply with Resources & Infrastructure (RII) Industry Package RIIOHS202A Enter and Work in Confined Spaces and complies with AS2865.	Complete once only
	Confined space refresher training	Every 3 years
	Cardio Pulmonary Resuscitation (CPR)	Yearly
Sydney Water staff undertaking confined space work	Confined space fitness test	Yearly
Contractors undertaking confined space work	Fitness test to (external or equivalent)	Yearly
Rescue team members. Standby person(s). At least one person in the confined space. (At least two	First Aid HLTFA311A	Every 3 years

Position	Training or competency	Frequency
people in a traverse party).		
Persons planning or implementing controls for engulfment.	Flow Isolation and / or Flow Management (FIFM)	Every 3 years
Specialist Gas Testing	This person has technical qualifications (minimum qualification - Chemical/biological/engineering technical certificate) and is trained to operate and response test gas testing equipment, including broad range detectors, hydrocarbon detectors and detector tubes and assess portable ventilation systems.	N/A
Front Line Advanced Gas (FLAG) Tester	Training in the use of 6 in 1 gas meter. Refresher training.	8 hours initial training. Yearly refresher.
Asset designers of confined spaces	Confined Spaces Management Overview. This is an online course that covers manager and supervisor responsibilities under the Work Health and Safety Regulation 2011 and this procedure.	Yearly
Responsible persons of assets, confined space work, construction, and mobile plant.	Confined Spaces Management Overview (if not certified for confined space entry). This is an online course that covers manager and supervisor responsibilities under the Work Health and Safety Regulation 2011 and this procedure.	Yearly

12.3. References

Document type	Title
Legislation	Work Health and Safety Act 2011 Work Health and Safety Regulations 2011 Chapter 4, Part 4.3
Policies and procedures	• WHSMS0034 Confined space standard. • WHSMS0017 Consultation procedure • WHSMS0026 Document and record management procedure. • SDIMS0026 Customer Delivery Facility Safety Signage Specification • WHSMS0062 Cranes and Lifting Operations. • WHSMS0053 Risk Management procedure. • Refer to Service Delivery DOC049. • HSP-070 Flow Isolation and/or Flow Management (FIFM). • WHSMS0052 Lock out tag out procedure • D0000146 Managing exposure to Ionising Radiation for guidance. • WHSMS0005 Control of Hot Work

Document type	Title
	• HSG0512 Confined Space Ventilation and Air Quality Monitoring • HSG-553 Safe Systems of Work for Sewage Facilities near Chemical Dosing Units • WHSMS0026 Document and record management procedure. • WHSMS0072 Fall prevention procedure for further guidance. • WHSMS0066 inspection, testing, monitoring and calibration • *HS-051 Safe Working on Roads* • HS-069 Personal protective equipment • Confined space fitness to work procedure.
Forms and checklists	• WHSMS0068.01 Attachment 1 Confined Space Assessment Tool. • WHSMS0068.02 Attachment 2 Delegation of Continuous Air Monitoring form • WHSMS0068.03 Attachment 3 Confined Space Entry Permit
Other documents	• Confined Spaces Code of Practice 2014 (Safe Work Australia) • AS 2865: 2009 Safe Working in a Confined Space • AS/NZS 1715: 2009 Selection, use and maintenance of respiratory protective equipment • AS/NZS 1716: 2012 Respiratory Protective Devices • AS 2030.1: 2009 Gas Cylinders – General Requirements • AS 2337.1: 2004 Gas Cylinder Test Stations – General Requirements • AS 1657 Fixed Platforms, Walkways, Stairways and ladders – Design, Construction and Installation • AS 1891.4 Industrial Fall Arrest Systems and Devices. Part 4 – Selection, Use and Maintenance • Guidance on interpretation of workplace exposure standards for airborne contaminants.

12.4. Attachments

Attachment	Title
1	Confined space assessment tool
2	Delegation of continuous gas monitoring
3	Confined space permit

13. Document control

13.1. Document details

Record	Detail
Procedure title	Confined space procedure

13.2. Ownership and approval

Role	Name	Position title	Date
Author	Eileen Conroy	Project & Implementation Advisor	15-June-2016
	Mark Worthington	Project & Implementation Advisor	15-June-2016
	Mathew Wood	Safety Project Officer	29-May-2017
Owner	Jose Perulero	Safety Systems Specialist	
Endorser	Tony Filacouridis	Head of Safety and Wellbeing	
Approver	Angela Tsoukatos	General Manager, People & Corporate Services	

13.3. Consultation

As elected by the WHSMS reference group. The following people were consulted for initial review of this document, or as part of a document delivery gap analysis. From there a draft document was put forward to all HSRs and workers for consultation.

Stakeholder	Position title	Date
Paul McCartan	Air Quality & Atmospheric Monitoring Manager	10-Feb-2016 and 11-May 2017
Jeff Scott	Plant Manager Level 1 (chemical dosing)	10-Feb-2016
Shaun Kenny	Air Quality Monitor Team Leader	10-Feb-2016
Charles Leung	Acting Manager Works Programming (civil programs)	10-Feb-2016 and 8-May-2017
Creagh Moore	WHSMS Project Manager	10-Feb-2016
Annette Halpin	Manager Injury Management	10-Feb-2016
Chris Bate	Safe & Well Team (Operations)	10-Feb-2016
Ann Guballa	Safe & Well Team (Risk & Solutions)	10-Feb-2016
Craig Earl	Hydrometric Operations Manager	10-Feb-2016 and 16-May 2017
Chloe Bates	Safe & Well Team (Risk & Solutions)	19-Feb-2016
James Craigie	Safe & Well Team (Operations)	19-Feb-2016
Phil McLean	Liveable City Solutions (LCS) Manager	19-Feb-2016
Emilio Charles	Temp Business Analyst (product & asset	19-Feb-2016

Stakeholder	Position title	Date
	management)	
Glen Nelson	Programme Delivery Officer Level 1 (LCS)	19-Feb-2016
Andrew Willoughby	Team Leader Civil Capability	27-Apr-2016 and 15-May-2017
Cheryl Marvell	Treatment Manager Wastewater North	23-May-2017
John Gillett	Field Response Manager	8-May-2017
Sean Croxen	Maintenance Services Technical Supervisor	8-May-2017
Michael Price	Inspection Services Supervisor	4-May-2017
Leon Whittingstall	Hydrometrics and Continuous Improvement - SWIRL	16-May-2017
Paul McVicar	Hydrometrics Services	16-May-2017
Graham Armstrong	Instrumentation and Control Services Manager	11-May-2017
Peter Chapman	Manager Civil Contracts	6-April-2017
James Campbell	Contract Manager	6-April-2017
Bernie Willis	Civil MMW Project Manager	5-April 2017
Shaun Gardener	Civil Planned Maintenance Manager	8-May-2017
Peter Djendjinovic	Civil Projects Manager	6-April-2017
Greg Bourke	Civil Reactive Maintenance Manager	6-April-2017

13.4. Review

Stage	Date
Original Procedure	September 2012 (HSP0001 version 7)
This review	29-May-2017 (Version 9)
Next review	29-May-2020

13.5. Change history

Version	Key changes
1-7	HSP0001
8	Major document upgrade to new format including: • Identification of training requirements • Updated legislation and codes of practice • Attachment of forms and tools

Version	Key changes
	• Requirement for rehearsal of incident preparedness • Requirement for review of control measure
9	Document updates including: • Restructured document to rectify flow of information • Update of Air Quality and Monitoring information including FLAG testing • Updated wording to ensure Flow Management works are still within the scope of the procedure • Added requirements for SWIRL hazard reporting